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An Alternative Repair System Casting Of Beams

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Abstract: **Fiber-reinforced polymer (FRP) application is an extremely effective approach to repair and strengthen structures that have grown to be structurally weak over their life time. FRP repair systems provide an economically viable alternative to traditional repair systems and materials. Experimental investigations the actual flexural and shear behavior of RC beams strengthened using continuous glass fiber reinforced polymer (GFRP) sheets are transported out. Externally reinforced concrete beams with epoxy-glued GFRP sheets were tested to failure utilizing a symmetrical two point concentrated static loading system. Two teams of beams were casted with this experimental test program. In SET I three beams weak in flexure were casted, from which one is controlled beam and other two beams were strengthened using continuous glass fiber reinforced polymer (GFRP) sheets in flexure. In SET II three beams weak in shear were casted, from which may be the controlled beam along with other two beams were strengthened using continuous glass fiber reinforced polymer (GFRP) sheets in shear. The strengthening from the beams is completed with various amount and configuration of GFRP sheets.**

Keywords: **Fiber Reinforced Polymer (FRP); RC Beams; Casting; Reinforced Concrete**

I. INTRODUCTION

The constant maintenance, rehabilitation and upgrading of structural people, is possibly probably the most crucial problems in civil engineering applications. Furthermore, a lot of structures built previously while using older design codes around the planet are structurally unsafe according into the new design codes. One from the challenges in strengthening of concrete structures is choice of a strengthening way in which will boost the strength and serviceability from the structure while addressing limitations like constructability, building operations, and budget. Structural strengthening might be needed because of a variety of situations. Additional strength may be needed to allow for greater loads to be placed to the structure. This really is frequently needed when using the dwelling changes along with a greater load-transporting capacity is needed. The result of quantity of GFRP layers and it is orientation on ultimate load transporting capacity and failure mode from the beams are investigated. Strengthening is needed for loads caused by wind and seismic forces in order to improve potential to deal with blast loading. Additional strength may be required as a result of deficiency within the structure's capability to carry the initial design loads [1]. Deficiencies could be the consequence of degeneration, structural damage, or errors within the original design or construction. The majority of structural strengthening involves improving the ability from the structural element to securely resist one or more from the following internal forces caused by loading: flexure, shear, axial, and torsion. Strengthening is accomplished by either lowering the magnitude of these forces or by enhancing the member's resistance to them. Typical strengthening techniques like section enlargement, externally glued reinforcement, publish-tensioning, and supplemental supports enables you to achieve improved strength and serviceability. Strengthening systems can enhance the resistance from the existing structure to internal forces either in a passive or active manner. Passive strengthening systems are typically engaged only when additional loads, beyond individuals existing at the duration of installation, are plied towards the structure. Connecting steel plates or fiber-reinforced polymer (FRP) composites the actual structural people are associated with passive strengthening systems. Active strengthening systems typically engage framework immediately might be accomplished by presenting exterior forces into the member that combat the effects of internal forces. In order to avoid the problems produced by the corrosion of steel reinforcement in concrete structures, studies have shown that you could switch the steel reinforcement by fiber reinforced polymer (FRP) reinforcement. Corrosion from the steel reinforcement in reinforced concrete (RC) structures affects the strength of both the steel and also the concrete. The strength of a corroding steel reinforcing bar is reduced due to a reduction within the mix-sectional area from the steel bar. One from the techniques used to bolster existing reinforced concrete people involves exterior connecting of steel plates by means of two-component epoxy glues. With this way, it's possible to improve the mechanical performance of the member. The wide utilization of this method for various structures, including structures and bridges, has shown its efficiency and it is convenience. Regardless of this fact, home plate connecting

technique presents some disadvantages because of the utilization of steel as strengthening material. Strengthening with adhesive glued ?beer reinforced polymers continues to be established as a good method relevant to various kinds of concrete structures for example posts, beams, slabs, and walls. Mongo several choices, this reinforcement might be by means of preformed laminates or flexible sheets. The purpose of this research is to investigate the flexural and shear behavior of reinforced concrete beams strengthened with different configuration and layers of GFRP sheets. More particularly, the result of the amount of GFRP layers and it is orientation around the strength and ductility of beams are investigated. Two sets of beams were fabricated and tested as much as failure. In SET I three beams weak in flexure were casted, of that the first is controlled beam and other two beams were strengthened using continuous glass fiber reinforced polymer (GFRP) sheets in flexure. In SET II three beams weak in shear were casted, of that the first is the controlled beam along with other two beams were strengthened by utilizing continuous glass fiber reinforced polymer (GFRP) sheets in shear. Continuous fiber-reinforced materials with polymeric matrix (FRP) end up being considered as composite, heterogeneous, and anisotropic materials with a prevalent straight line elastic behavior up to failure. Fiber reinforced polymer (FRP) is really a composite material produced by mixing several materials to provide a new mixture of qualities [2]. Glass fibers are also available as thin sheets, known as mats. Additionally, they're vulnerable to creep and also have low fatigue strength. To boost the text between fibers and matrix, in addition to safeguard the fibers itself against alkaline agents and moisture, fibers undergo sizing treatments serving as coupling agents.

Fig.1. Fixing of GFRP sheet on the beam

II. METHODOLOGY

The experimental study includes casting of two teams of reinforced concrete (RC) beams. In SET I three beams weak in flexure were casted, from which is controlled beam along with other two beams were strengthened using continuous glass fiber reinforced polymer (GFRP) sheets in flexure. In SET II three beams weak in shear were casted, of that the first is the controlled beam and other two beams were strengthened by using continuous glass fiber reinforced polymer (GFRP) sheets in shear. The strengthening from the beams is done with different configuration and layers of GFRP sheets. Experimental data on load, deflection and failure modes of each one of the beams were acquired. The modification in load transporting capacity and failure mode from the beams is investigated because the amount and configuration of GFRP sheets are altered. The next chapter describes at length the experimental study. Two teams of beams were casted for this experimental test program. In SET I three beams (F1, F2 and F3) weak in flexure were casted using same grade of concrete and reinforcement detailing [3]. In SET II three beams (S1, S2 and S3) weak in shear were casted using same grade of concrete and reinforcement detailing. Fresh concrete, being plastic requires some kind of form work to mould it into the needed shape also to hold it till it sets. The shape work has, therefore, reached be suitably designed. It ought to be sufficiently strong to accept dead load and live load, during construction and it should be rigid enough so pad any bulging, twisting or sagging because of the load if minimized, Wooden beams, and mild steel sheets, wood, and many other materials may also be used. Formwork should be capable of supporting securely all vertical and lateral loads that may be applied to it until such loads may be supported by the ground, the concrete structure, or other construction with sufficient strength and stability. Dead loads on formwork contain the load from the forms and also the weight of and pressures from freshly placed concrete. The shape work employed for casting of all of the specimen includes mould prepared with two Funnel sections of iron screwed by iron plates at the ends. The form work was completely cleaned and all sorts of corners and junctions were correctly sealed by plaster of Paris to prevent leakage of concrete through small openings. Shuttering oil ended up being put on the interior face from the form work. The reinforcement cage ended up being put into position within the form work carefully according to an obvious cover of 20 mm for that bottom and top bars. Mixing Of Concrete: Mixing of concrete should be done completely to ensure that concrete of uniform quantity is acquired. Hands mixing are completed in small works, while machine mixing is completed for those big and important works. A clear surface is needed for this purpose, like a clean, even, paved surface or perhaps a wood platform getting tight joints to avoid paste loss. COMPACTION: All examples were compacted by using needle vibrator for good compaction of concrete. Sufficient care was come to avoid displacement from the reinforcement cage within the form work. Finally the top of concrete was leveled and handle and smoothened by metal trowel and wooden float. Strengthening

Of Beams: Before connecting the composite fabric to the concrete surface, the needed region of concrete surface is made rough utilizing a coarse emery paper texture and cleaned by having an air blower to get rid of all debris and dirt. When the surface was ready to the needed standard, the epoxy resin was mixed in compliance with manufacturer's instructions. Mixing was transported in a plastic container and it was ongoing before the mixture was at uniform color. If this was completed and also the fabrics have been cut to size, the epoxy resin was put on the concrete surface. The composite fabric ended up being placed on the top of epoxy resin coating and also the resin was squeezed via the roving from the fabric using the roller. Air bubbles entrapped at the epoxy/concrete or epoxy/fabric interface were to become eliminated. Then the 2nd layer from the epoxy resin was applied and GFRP sheet was then placed on top of epoxy resin coating and also the resin was squeezed via the roving from the fabric using the roller and also the above process was repeated [4]. During hardening from the epoxy, a constant uniform pressure was put on the composite fabric surface to be able to extrude the surplus epoxy resin and also to ensure good contact between your epoxy, the concrete and also the fabric. This operation was transported out at 70 degrees. Concrete beams strengthened with glass fiber fabric were cured for twenty-four hrs at 70 degrees before testing. Flexural Strengthening Of Beams: To increase flexural strength, FRP fabrics are glued being an exterior reinforcement to the tension side of steel-reinforced concrete beams with fiber orientation along the member length. Depending to the ratio of FRP reinforcement area into the beam's mix-sectional area and also the section of internal steel reinforcement, the increase in flexural strength could be more than 100%. However, a flexural strength increase as much as 50% could be more realistic, which depends on practical factors because the concrete member dimensions, serviceability limits, ductility, productive thickness of FRP fabric reinforcement [5]. The design philosophy of strengthening rectangular RC beams, is equally relevant with other shapes for example T- and that I-sections getting non-prestressed reinforcement.

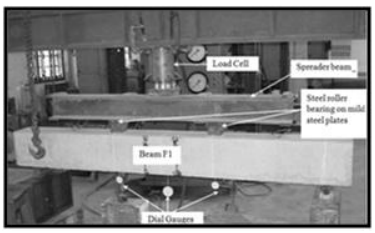

Fig.2.Proposed system

III. CONCLUSION

In this experimental analysis they ?aural and shear conduct of reinforced concrete beams strengthened by GFRP sheets are studied. Two sets of reinforced concrete (RC) exams, in SET I three beams weak in flexure as well as in SET II three beams weak in shear were casted and tested. On the test results and calculated strength values, the following conclusions are attracted: A)>SET I Beams: Initial flexural cracks appear in a greater load by strengthening the beam at soffit. The best load transporting capacity from the strengthen beam F2 is thirty three percent more than the controlled beam F1. Load at initial cracks is further elevated by strengthening the beam in the soffit and also to the two sides from the beam up into the neutral axis on the soffit. The best load transporting capacity from the strengthen beam F3 is 43 % more than the controlled beam F1 and seven % greater than the strengthen beam F2. It is therefore suggested to determine the shear strength from the beam and execute shear strengthening together with flexural strengthening if needed. Flexural strengthening to the neutral axis from the beam boosts the ultimate load transporting capacity; however the cracks developed weren't visible up to and including greater load. Because of invisibility from the initial cracks, it gives less warning compared into the beams strengthen limited to the soffit from the beam. By strengthening up into the neutral axis from the beam, increase within the ultimate load transporting capacity from the beam isn't significant and price participation is nearly three occasions when compared to beam strengthen by GFRP sheet in the soffit only. B) SET II Beams: The control beam S1 unsuccessful in shear because it is made intentionally weak in shear. The initial cracks within the strengthen beams S2 and S3 seems at greater load when compared to united nations-strengthen beam S1. The ultimate failure is flexural failure which signifies the GFRP sheets boost the shear strength from the beam. The best load transporting capacity from the strengthen beam S2 is 31 % greater than the controlled beam S1. When the beam is strengthen by U-wrapping within the shear zone, the ultimate load transporting capacity is elevated by 48 % when compared to control beam S1 by 13% compared the beam S2 strengthen by connecting the GFRP sheets around the vertical sides alone within the shear zone from the beam. The connecting between GFRP sheet and also the concrete is intact to the failure from the beam which clearly signifies the composite action because of GFRP sheet. Restoring or upgrading the shear strength of beams using GFRP sheet might result in elevated shear strength and stiffness with no visible shear cracks.

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